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Landscape for Living

The world of growing things affords a good remedy for the fever and fret of modern life. For man is ever a child of nature's open places. In each of us there is an ancestral yearning for close and intimate contact with the earth, a yearning that some 80 million Americans fulfill through the hobby of gardening.

These gardeners and those who would join their ranks can find instruction and inspiration in the latest Yearbook of Agriculture, *Landscape for Living.* Its 416 pages and 175 photos unfold the theme of enhancing our environment with plants. Some measure of this Yearbook's scope is indicated by the division of its 62 chapters into 8 sections bearing such titles as: *Plants in the Living Environment; Searching for, Breeding, and Propagating Plants; Understanding Plant Growth;* and *Planning for Growth Centers.* As Secretary of Agriculture Earl L. Butz notes in a foreword, the Yearbook offers "something for everyone on improving the quality of life in urban and suburban America, and in the countryside." The 1972 Yearbook carries material of interest not only to home gardeners—even those whose "plot" is a humble pot on the windowsill—but also to citizen, government, and business groups concerned with environmental quality.

Home gardeners, for example, can find advice on improving the soil, tending lawns, growing vegetables, controlling pests, landscaping home grounds, and selecting plants for special purposes, to cite only a few topics. Of broad appeal in today's era of smaller and less frequently tended gardens is a chapter on minimum care plantings which require only an hour or two of upkeep a week.

But the universality of plants extends far beyond yards and gardens. In urban areas, particularly, there are many places that cry for something green to help soften the clutter and overcome the ugliness that diminishes the human spirit. The Yearbook tells how plants can bring beauty to malls, parks, roadsides, shopping centers, even the concrete-bound neighborhoods of inner cities. Plants can also play a vital role in teaching youth about the environment, in engaging the talents of senior citizens in rewarding activities, and in offering hope for more landscape amenities in the future. Indeed, in the name of ecology and environment, we are exhorted on every hand to plant a tree or shrub for tomorrow. The hard truth is that a vast amount of public information is needed if these well-intentioned plantings are to survive. The Yearbook admirably helps meet that need.

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COVER: Mink of the violet color phase were exposed to intense sonic booms during the whelping season. Under deliberately stringent tests, the mink showed no adverse effects on behavior, reproduction, or growth of kits. See story p. 8. (Photos on pages 8 & 9 courtesy U.S. Air Force).

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Earl L. Butz, Secretary
U.S. Department of Agriculture

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(BN–39380)

The Rainmakers

—*do they help or hinder?*

THE USEFULNESS of current weather modification programs—seeding clouds with silver iodide to increase rainfall, suppress hail, or reduce lightning—is questioned by some scientists who believe the practice may have a negative rather than a positive effect.

Although convective cloud seeding has been a commercial venture in this country for some years, no large-scale, controlled studies have been carried out that have proved or disproved its

worth. ARS hydraulic engineer Herbert B. Osborn, Tucson, Ariz., believes that the practice should be discouraged until results are in from such studies.

Dr. Osborn reached his conclusion after studying data from 133 U.S. Weather Bureau rain gages scattered throughout Arizona and from 26 recording rain gages on the U.S. Department of Agriculture's Walnut Gulch Experimental Watershed near Tombstone.

Analysis of the Walnut Gulch data from 1957 through 1964 suggests that, on the relatively few days when that area was downwind from a convective cloud–seeding experiment in the Santa Catalina Mountains, 65 miles to the northwest, there was a highly significant decrease in rainfall on seeded as opposed to nonseeded experimental days. The overall decrease amounted to about 40 percent less rainfall on seeded as against nonseeded days during 212 experimental days in 7 years.

These findings were backed up by data from a network of rain gages in the Santa Catalina Mountains operated by the Institute of Atmospheric Physics, University of Arizona, from 1957 through 1964. These data indicated about 30 percent less rainfall on seeded as opposed to nonseeded days, although the results are not statistically significant, possibly because of the placement and small number of gages.

Data taken from Weather Bureau gages after a cloud–seeding program in the summer of 1971, when compared with the 10-year average, did not show increases in rainfall during seeding. In general, during the period, rainfall in southern and western Arizona was far above average, while in northeastern and eastern parts of the State it was far below average.

Rainfall within the seeded area—central and east central, primarily—varied widely but was about average overall. Comparison of rain gage records in and around the target area suggest that the 1971 summer cloud seeding actually may have decreased rainfall in and for some considerable distance downwind from the seeded area. Because of the scarcity of rain gages in most regions of Arizona, the evidence is not conclusive in any way, and that's why Dr. Osborn believes further controlled experiments on the effects of thunderstorm cloud seeding should be carried out.

Cloud seeding is based on old scientific beliefs that all rain starts in clouds as snow and, during the summer, melts when it comes in contact with air temperatures above the freezing mark. Condensation forming around nuclei—small dust particles, salt from the sea, among other things—is supposed to have converted cold but unfrozen droplets into snowflakes when the clouds were at certain temperature ranges (-5 to $-40°$ F.). By seeding with silver iodide crystals, weather modifiers believe they not only provide a greater abundance of "seed crystals" or artificial nuclei but that the silver iodide also starts ice crystal formation at higher temperatures (5 to 25° F.).

It has been learned in recent years that in actual practice, the conversion of unfrozen cloud droplets into snow proceeds rapidly every time a cloud at temperatures below 32° F. is treated with effective seeding agents. Some scientists, including Dr. Osborn, believe, however, that the resultant increase seen in summer rainfall from seeded clouds is very small.

Reasons cited for the small increase is that over warm areas like Arizona and New Mexico the low intensity rain formed from melting snow often evaporates before it reaches the ground.

Also, clouds in the tropics with temperatures above freezing form rain in huge amounts by liquid coalescence—the merging of small droplets into larger ones—in no way involving ice. The same processes appear to produce rain in summer thunderclouds over Arizona and New Mexico, but the processes seem to slow down or stop when snowflakes develop in the clouds. □

Machine that restores rangeland

Several million acres of once-productive rangeland in arid and semi-arid areas that have been lost to noxious shrubs can be regained for grazing.

Shrubs, such as creosotebush and tarbush, do not provide useful forage or adequate ground cover to prevent soil erosion. On many sites where these shrubs persist, the soil can support useful forage growth if desirable species can be established.

Range scientist Carlton H. Herbel of ARS and agricultural engineer George H. Abernathy of the New Mexico Agricultural Experiment Station, Las Cruces, developed and tested equipment that would uproot shrubs, make a good seedbed, plant seed, and distribute brush over the seeded strip to shade the ground—all in a single pass over the land.

If the only problem were to eliminate the brush, it could be successfully solved with commercially available root-plowing equipment. But this technique leaves the soil in poor seedbed condition.

Suitable forage crops would have to the planted at ¼ to ½ inch in depth, exposing them to high temperatures and low soil moisture in these arid conditions. If uprooted vegetation could be placed over seeded rangeland, more favorable conditions would be provided for germination and emergence.

The experimental equipment consists of commercial machinery in addition to some designed specifically for the project. A major innovation was the seed planter and conveyor. The planter has separate

Right: *A USIA team in the Army helicopter photographs the brush control and seeding equipment for foreign audiences (PN–2793).* ***Middle:*** *This land has been treated and seed placed in the basin pits and packed strips (PN–2794).* ***Below:*** *A three-year-old seeding that has been transformed from near worthless rangeland to good rangeland with just one treatment (PN–2795).*

seedboxes for large and small seed and a set of four, 350-lb. press wheels which pack the loose soil. Inverted 1-inch angle iron welded to the center of the press wheel rim forms a small, V-shaped notch in the soil into which the seed is placed.

Uprooted shrubs are carried over the top of the planter by the conveyor. Seeds are placed in bare ground, then covered by ¼ to ½ inch of soil and by loose brush.

Planting trials were conducted on 23 experimental plots across southern New Mexico. Most of the plots were about 5 acres in size and were seeded with a mix of desirable species adapted to the site. Overall, about 50 percent of the seedings were considered successful.

The scientists concluded that much of the depleted rangeland in southern New Mexico can be restored. On sites completely dominated by creosotebush and tarbush, root plowing followed by seeding with proper equipment can be successful. However, there are several site requirements for success:

- Soil should be resistant to wind erosion.
- The slope should be gradual enough to resist water erosion.
- A minimum rainfall of 9 inches or more.
- Planting equipment should remove the brush to allow planting in bare soil and provide for seed covering to a very shallow depth.
- Small water-holding basins must be formed.
- The brush residue should be placed over the planted area. □

Controlled environments ease cotton processing

*Above: Physicist Albert Baril, Jr., weighs cotton sample to see if it has reached equilibrium with the atmosphere in the environmental chamber prior to making an experimental run to determine optimum temperature and relative humidity for most efficient cotton processing (PN–2796). **Below right** and **Center:** Fine adjustments are being made on pressure rolls to determine force requirements necessary in separating cotton fibers under various temperature-relative humidity combinations (PN–2797, PN–2798).*

HIGH TEMPERATURE and high relative humidity may spell muggy weather for people, but they may also be a key to developing a better system for processing cotton.

According to a recent ARS study, raising the temperature and relative humidity can reduce the forces needed to separate and individualize cotton fibers by as much as 35 to 45 percent.

These findings are the result of one phase of an ARS research program to develop a fundamentally new continuous system for processing cotton textiles. (AGR. RES., March 1969, p. 14.)

Investigations in the program have been primarily concerned with the study of aerodynamic, electrostatic, ultrasonic, and magnetic forces for manipulating cotton fiber. Research to date, however, indicates that the most difficult problem in developing a new system is fiber separation prior to the manufacture of yarn.

Research on this problem was conducted by physicists Albert Baril, Jr., and Lloyd B. DeLuca and research engineer Mayer Mayer, Jr., Southern Research laboratory, New Orleans.

For their study, the researchers used a mill-type cotton blend of 20 percent

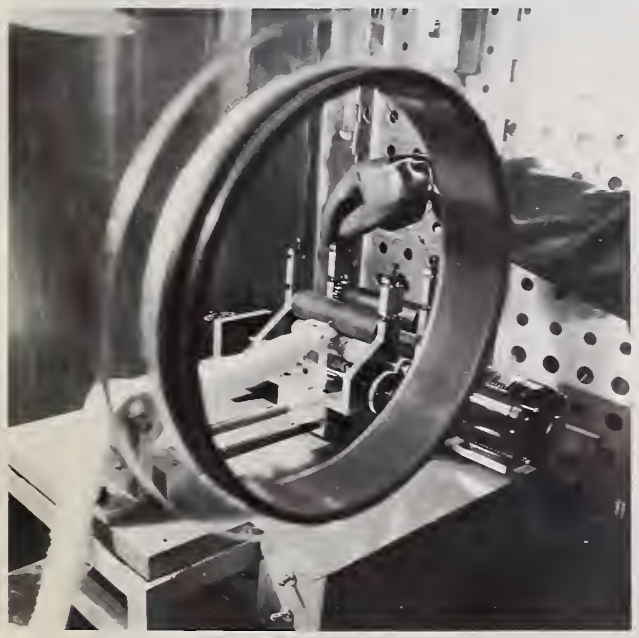
Eastern growth, 40 percent Western growth, and 40 percent Memphis growth. Staple length was $1\frac{1}{16}$ inches, with a 4.7 Micronaire (measurement of fineness) reading.

Although no narrowly specific temperature-humidity combination was found, improvements in minimum requirements of force for best fiber separation were noted as both temperature and humidity were increased.

The minimum force requirements were found to lie in a temperature range of 121° to 138° F. and a relative humidity range of 65 to 95 percent.

Moreover, the researchers point out that the higher temperatures and humidities should have no adverse effects on mill operating personnel. In their proposed system, the cotton fibers will be handled in closed chambers where temperature and humidity could be very closely monitored.

Should the warmer, more humid conditions be applied to equipment now in use throughout the textile industry, some sort of special shrouds could be developed to trap the heat and humidity, leaving the overall atmosphere of the mill in a range more comfortable for operating personnel. □



Above: *Keeping these experimental devices in top running order is essential in measuring forces required to separate the cotton fibers. Here the tension on the pressure rolls is being adjusted. (PN–2800).* ***Left:*** *Mr. Baril changes gears to alter drafting ratio in experimental apparatus (PN–2799).*

Operation Cool Mink

EXPOSURE of farm-raised mink to intense sonic booms during the whelping season had no adverse effect on behavior, reproduction, or the subsequent growth of the kits.

This is the conclusion drawn by 10 scientists representing ARS, the U.S. Air Force, the University of Alaska, and Washington State University who joined in an interdisciplinary study involving 350 yearling and 148 2-year-old female mink and their 1,845 progeny. The study was observed by representatives of the National Academy of Sciences, the U.S. Department of the Interior, the Federal Aviation Administration, and the Mink Farmers Research Foundation.

The experiment provides convincing evidence to help resolve conflicting views among mink growers on whether sonic booms produced by jet planes are damaging to mink. Claims totaling more than $609,000 were filed against the U.S. Air Force in fiscal years 1961–70 alleging damage to mink by sonic booms.

The scientists devised a deliberately stringent test. The mink were boomed when 40 percent of the females had whelped, a time when mink are believed to be easily disturbed. Test animals were of the violet color phase, a strain less hardy and more difficult to raise than mink not homozygous for the Aleutian genes.

The test mink were exposed to three sonic booms—at 10:58 a.m., 11:44 a.m., and 12 noon—produced by a U.S. Air Force F–4 Phantom jet plane on a straight-level flight path at 8,000 feet. Overpressures measured on the ground plane averaged 5.05 pounds per square foot—roughly comparable to the intensity of a loud nearby thunderclap.

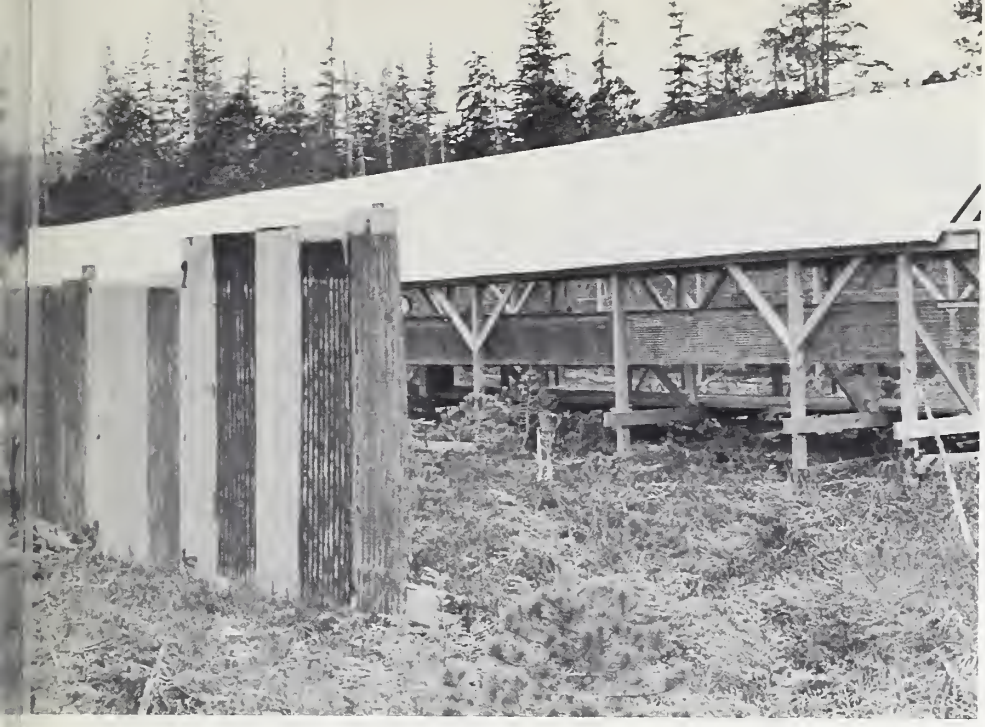
The researchers chose Mitkof Island, near Petersburg, Alaska, for the study because mink are successfully raised there, experienced management personnel were available, test mink could be boomed without disturbing the control site or any nearby residents, and isolation would prevent other disturbance of the animals.

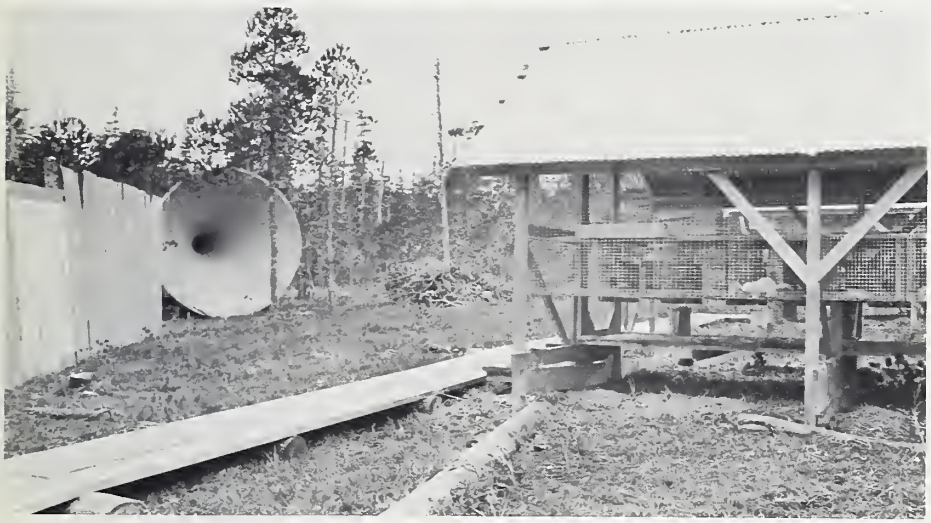
Farm-raised mink purchased in Oregon were air-lifted in January to Alaska where they were randomly divided into three groups—one to be subjected to actual sonic booms, one to be exposed to simulated sonic booms produced by a device used in an earlier ARS study (AGR. RES., July 1968, p. 11), and one as unboomed controls. The mink, housed in wire cages suspended under protecting roofs, were fed and handled alike and were bred between March 13 and April 5. The actual sonic boom test was concluded May 11 and the simulated boom test May 12.

Analysis of reproduction and growth data showed no statistically significant differences between the groups in number of kits born per female whelping, number of kits alive at 5 or 10 days per female whelping, or mean weight of kits at 49 days. Thirty male and 30 female kits randomly selected from each treatment were raised to pelting age and sold on the Seattle commercial market on February 3. No significant differences related to treatment were noted in final weight, final body weight, pelt value, or selling price.

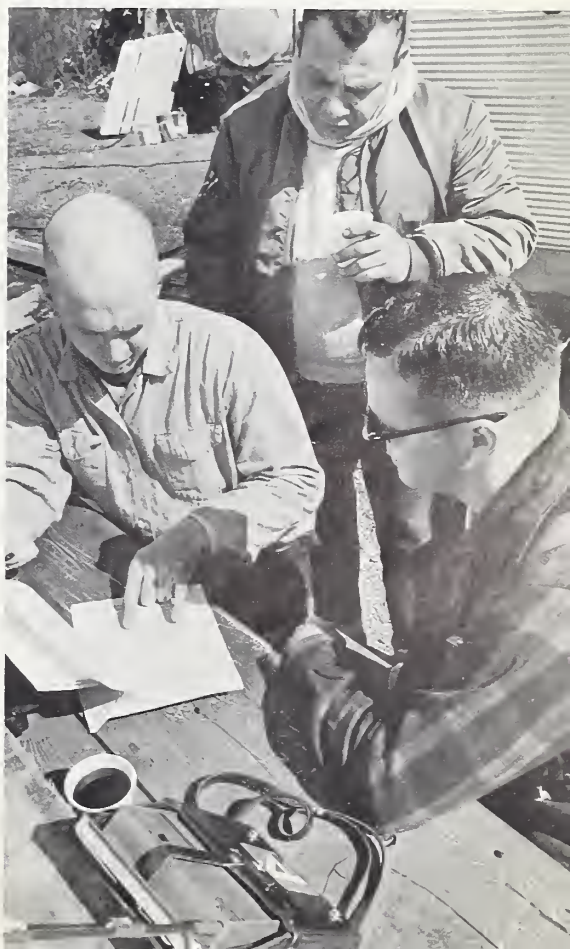
A comparison of mink behavior on days of actual or simulated sonic boom and on previous days indicated that response to booms was brief and had no apparent long-term effect on either females or newborn kits. No panic behavior was observed, and most of the animals returned to pre-boom activities within 60 to 120 seconds. A decrease in response to the second and third booms suggested that the observed mink adapted quickly to recurring sonic booms not accompanied by visual or olfactory cues to danger.

Autopsies of all mink that died immediately before or after exposure to booms indicated spontaneous diseases commonly found in ranch mink. None of the deaths could be related to sonic booms. Bacterial examination of mink that died or were sacrificed likewise





Above: At the boom test site, observers and Air Force motion picture cameras are ready for the simulated sonic test. Personnel (left to right); unidentified; ARS biometrician Ruel L. Wilson, Beltsville; Donald W. Wustenberg, Bay City, Ore., Mink Farmers Research Foundation observer; Dr. Wilson B. Bell, Virginia Polytechnic Institute and State University, Blacksburg, National Academy of Sciences observer; Maj. William McCormack, Office of Judge Advocate General, USAF, Wash., D.C.; T/Sgt. James K. Vincent, USAF cameraman, Elmendorf AF Base, Alaska; Lt. Col. (Dr.) F. R. Robinson, pathologist, Wash., D.C. (BN–39385). ***Far left:*** *Ronald G. Stephenson, Cedarburg, Wis., Mink Farmers Research Foundation, observes behavior of four mink. All activities and time of occurrence are recorded on tape (BN–39388).* ***Left:*** *Inside the barrier at simulator site, mink are housed in commercial-type cages suspended from a protecting roof. Horn of sonic boom simulator is at left. There are four cages (one female mink per cage) between each vertical support. Nest boxes are at back of cages (BN–39387).* ***Below:*** *Planning coordination between ground radio station and plane are (left to right) Hunter Horvath, mink caretaker for University of Alaska, T/Sgt. Samuel H. Firth, USAF power production specialist, Elmendorf AF Base and Maj. Phil Bowen, USAF, Wash., D.C., logistics coordinator for the project (BN–39386).*



gave no evidence that bacterial disease was induced by exposure to booms. Examination of females and kits 8 weeks after the booms showed bacterial disease apparently not related to the treatment. No Aleutian disease nor other virus diseases were found.

Researchers participating in the study were animal scientists James Bond and Hugh F. Travis, agricultural engineer John R. Menear, and biometrician Ruel L. Wilson, all of ARS; veterinary toxicologist Walter E. Brewer, pathologist F. R. Robinson, bacteriologist Glenn A. Huttenhauer, and animal behaviorist Charles R. Curran, all of the U.S. Air Force; biologist James R. Leekley of the Institute of Agricultural Sciences, University of Alaska, Petersburg; and veterinary pathologist James B. Henson of Washington State University, Pullman.

The study was funded by the Federal Aviation Administration and was coordinated by J. K. Power, Ray Shepanek, and George Bromfield of the FAA Office of Noise Abatement. Research was conducted according to principles enunciated in the "Guide for Animal Facilities and Care" prepared by the National Academy of Sciences-National Research Council. □

vacuuming the golden nematode

LABORIOUS METHODS of gathering soil samples for golden nematode survey purposes may be eliminated with the development of a simple, easy-to-use nematode sampler.

The golden nematode, a tiny eelworm, is one of the most damaging pests of potatoes. It was contained on Long Island, N.Y., by Federal and State plant pest control programs from its discovery in 1941 until 1967, when it was found in Steuben County, N.Y. In 1969, it was found in New Castle, County, Del. The golden nematode remains a threat to the country's $800 million potato industry.

Nematode eggs are enclosed by nature in protective flask-shaped cysts—the dead swollen bodies of the females. The cysts are smaller than a pinhead, light in weight, and contain up to 500 eggs and larvae.

In present methods of surveying fields for nematodes, a man stoops down, scoops soil into a labeled bag, takes a couple of steps, and repeats the process. The bags are sent to a laboratory where the samples are examined for cysts.

In the laboratory, the soil is placed in 10-gallon water containers where the cysts float to the top. Laboratory work is expected to be greatly reduced during analysis since the new sampler gathers about 1/10 as much soil as hand sampling.

If viable cysts are found, the soil is fumigated by plant protection workers. Meantime, ARS and Cornell University continue work on the development of nematode-resistant varieties of potatoes.

There had to be a better way to survey fields, thought Irving Granek, supervisor of USDA's Animal and Plant Health Inspection Service Golden Nematode Laboratory, Hicksville, N.Y. He built a prototype nematode sampler later modified by agricultural engineer Paul E. James and technician Hilding V. Anderson, Beltsville, Md.

The sampler works on the same principle as a household vacuum cleaner, but with much less suction. The fan is powered by an ordinary automobile battery. Little suction is needed to dislodge the cysts and suck them into a bag in the sampler. Minimal suction also cuts down on the soil and trash taken into the sampler with the cysts.

Built on a three-wheeled chassis, the sampler is simply a sealed box with a small fan enclosed in the side. A 2-inch-diameter copper tube is inserted into the center of the container top, with about 1 inch of the tube outside the box and 4 inches extending down into the box.

A flexible duct attached to the outer portion of the copper tube above the lid runs to the sample pick–up head beneath the machine. The inner portion of the tube extends below the lid into a labeled bag placed in the box to catch the samples.

When the fan is turned on, air and nematodes are drawn from the sampler head, up through the duct and down into the labeled bag. The air then circulates out the top of the bag and through the fan to the exterior. Any samples of cysts or small soil particles and trash are deposited in the bottom of the bag.

The sampler head runs on small skids and is flexible enough to roll and pitch with the terrain. The head has small spring wire "combs" that aid in disturbing any cysts present on the surface soil.

Modifications are expected to be made to the prototype after further use under actual field conditions. □

Right: *Donald E. Wuertz (left) starts motor on portable 20 gal. sprayer. The sprayer is modified with pressure gage and hose attached to manifold. Winand K. Hoek (right), examines injectors inserted in tree and safety belt attached to each injector (BN–39383).*

To save a tree: New hope against Dutch Elm disease

FOR THE FIRST TIME there is hope of curing elm trees infected with Dutch elm disease. This hope is based upon two simultaneous developments: a pressure technique for injecting mature trees with chemicals, and the development of a water-soluble form of benomyl which will inhibit the fungus within without damage to the elm.

Benomyl, a systemic fungicide, was shown in 1969 to be effective in combating the Dutch elm disease (DED) fungus in young elm trees growing in sand in the greenhouse (AGR. RES., March 1970, p. 3). Benomyl applied to soil in its normal form is not readily taken up by mature trees.

Plant pathologists Winand K. Hock and Lawrence R. Schreiber, and technician Donald E. Wuertz of ARS' Shade Tree and Ornamental Plants Laboratory in Delaware, Ohio, tackled this problem. They found a way to make benomyl more soluble in water, and in addition, developed a pressure technique to inject solutions into trees. The pressure technique was developed in cooperation with plant pathologist Eugene B. Himelick associated with the Illinois Natural History Survey, Urbana.

The pressure technique consists of drilling a hole in the tree trunk and screwing a threaded pipe into the xylem vessels which carry water throughout the tree. Then by means of compressed air, the solution is forced into the xylem vessels where it is transported even into the smallest twigs and leaves. The pressure technique was so successful when first tried with a red dye that the scientists reported they "had achieved the first red-leaved elm."

Benomyl is toxic to the fungus causing DED but is not very toxic to mammals and is not nearly as persistent as DDT. With the new injection technique, the fungicide is introduced directly into the tree where there is little if any chance for environmental contamination.

In the spring and summer of 1972, ARS scientists will meet DED head–on by injecting benomyl into many diseased elms. All trees will be periodically checked and the progress of the disease recorded over the next few years.

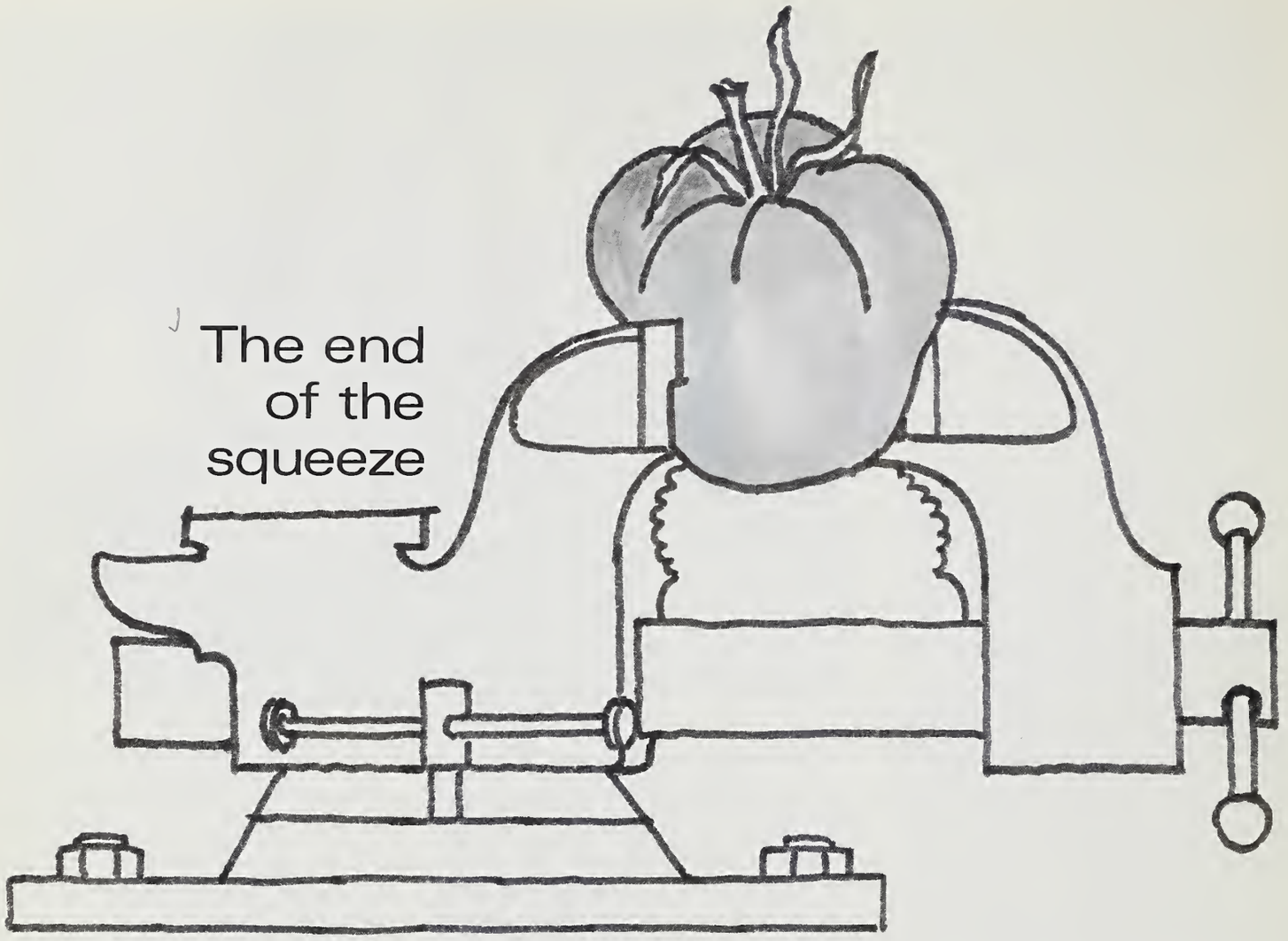
Many factors concerning the treatment need to be assessed, such as: Will trees need more than a single treatment? What concentration of benomyl will work best? How will benomyl affect a mature tree over a period of time, even though young greenhouse trees suffered no ill effects from the fungicide?

It will take 2 to 4 years to demonstrate the effectiveness of these two new developments, and to demonstrate that elms can be cured of Dutch elm disease. To date, there has been no cure for the disease, and trees once infected with the disease eventually die.

This novel injection technique ushers in a new era in the treatment of shade and ornamental tree diseases. Scientists may be able to tailor the size of urban trees with growth regulators and will be able to feed soluble nutrients to hungry city trees whose roots are covered by asphalt and concrete. They may also be able to treat elm phloem necrosis, the next most serious elm disease, which cannot be controlled by current methods.

Although the last chapter in the battle with DED has not yet been concluded, it certainly seems to have begun for the estimated 400,000 elms lost each year in this country to DED. □

The end of the squeeze



TECHNOLOGY may one day help put tomatoes of uniform quality on the market. Gone then would be the days of shoppers squeezing tomatoes for ripeness. All tomatoes on the market would be equally ripe and ready to eat.

ARS horticulturist John T. Worthington, Beltsville, Md., developed a technique that utilizes tomato light transmittance to determine degree of maturity, enabling him to predict tomato ripening rate. ARS mechanical engineer Ronald W. Penney, Beltsville, then formulated an equation from the results of Mr. Worthington's technique which predicts tomato ripening date.

Tomatoes are presently removed from storage when visual checks deem them ripe. This requires periodic examination of tomatoes and leads to bruise damage in addition to high costs.

Mr. Worthington measures light transmittance of sample tomatoes with a four-filter photometer developed by the engineers of the Instrumentation Research Laboratory, Beltsville. The four filters are arranged in a wheel, and any two optical densities can be read simultaneously on two meters. Light is focused through a selected filter, then passed through the sample fruit.

Measurements on intact tomatoes are made at 510, 560, 600, and 690 nanometers (nm), and the optical density and optical density differences between readings for 510–600 and 600–690 nm are recorded.

Green tomatoes are sorted into maturity classes using the 510–600 optical density difference. Degree of ripeness after the breaker stage, when tomatoes start turning red, is indicated by the 600–690 difference.

Light transmittance of fruits allowed to ripen at 55°, 60°, 65° and 70° F. was measured daily. Using these readings, Mr. Penney formulated his equation. Prediction of the days needed to ripen the fruit is derived from Mr. Penney's equation by inserting specific light transmittance values and holding temperatures into the formula.

Until now, the date of tomato ripening has rested on the whims of nature.

Shipments of tomatoes have been heterogeneous in maturity. Some ripen during shipment, some soon after shipment, and some long after shipment. Using the prediction formula, shippers could tailor the degree of fruit ripeness to the packer's desires.

The formula could also be used to manipulate the ripeness of fruits of different maturity levels. Fruits that normally ripen slowly (immature fruit) could be held at higher ripening temperatures. Ripening of fruits with too much color (breakers) could be slowed down by a lower temperature. □

Keeping a check on alfalfa weed

DODDER, a parasitic, twining weed that can devastate an alfalfa crop, may now be efficiently controlled for an extended period with a single chemical application.

ARS agronomist Jean H. Dawson, Prosser, Wash., developed a means of maintaining the potency of isopropyl *m*-chlorocarbanilate (chlorpropham or CIPC), a dodder-control chemical. The weed is especially troublesome in alfalfa seed-producing areas of the West, causing large money losses by reducing seed yields, lowering seed quality, interfering with machine harvesting, and adding to the cost of cleaning seed.

Known by such colorful names as strangle-weed, devils-hair, and hellbind, dodder commonly appears as dense tangles of leafless, orange or yellow strands on its host plants. Dodder also attacks clovers, flax, sugar beets, onions, some ornamentals, carrots grown for seed, and potatoes in addition to alfalfa.

Although chlorpropham is used to control dodder, there are many application problems. Chlorpropham is volatile and remains active for only 4 weeks in the soil. Since dodder that emerges over a 16-week period from late March through July requires control, compromise measures must be taken.

For example, application of chlorpropham is usually delayed until the alfalfa is 4 to 8 inches tall to increase the likelihood of enough foliage to control dodder by shading. This delay, however, may permit time for some dodder to emerge and attach to host plants before herbicide is applied.

Since alfalfa has already emerged, a granular formulation must then be used to reach the soil without sticking to the leaves, and this form is more expensive and more difficult to apply uniformly than sprayed material. The chemical dissipates rapidly; thus, two applications are needed for full-season dodder control. All in all, chlorpropham would be much more effective if persistence in the soil could be extended somewhat.

Dr. Dawson pulled together knowledge gained from past research to test a different technique. Early investigations showed that soil bacteria degrade chlorpropham and that an enzyme isolated from the bacteria triggers the reaction. Also, *p*-chlorophenyl *N*-methylcarbamate (PCMC) was found to inhibit microbial degradation of chlorpropham and increase its persistence in the soil.

In the current research, liquid chlorpropham alone or with PCMC was applied in February, March, and April. Dodder control from these treatments was compared with that from the standard treatment, granular chlorpropham applied in April.

Chlorpropham alone, at about 6 lbs. per acre did the job, but not for long enough. Applied in April, in granular or liquid forms, it controlled only the first emergence of dodder. The March application did not control dodder satisfactorily. Moreover, the same amount mixed with PCMC and applied in February or March consistently controlled early and later emergence of dodder. Late winter or early spring applications of chlorpropham plus PCMC appeared to be flexible with respect to timing.

Results of this research indicate that PCMC prolongs the persistence of chlorpropham in soil and increases the period of dodder control.

Chlorpropham is registered for use in alfalfa grown for seed, hay, and forage. PCMC is an experimental compound and not registered for the uses evaluated. Before a chemical can be released to the public, it must undergo stringent tests by its manufacturer, who then submits test data and the product to the Federal Government for evaluation and registration. □

Dodder on alfalfa in a vegetative (prebloom) stage (BN–5434).

BLAST FREEZING · Rx for ham shrinkage

FREEZING A HAM in a blast freezer, then ice-glazing it, saves much shrinkage or weight loss during refrigerated storage in a commercial warehouse.

The holding of hams in frozen storage to balance pork supplies during periods of high and low production is a common practice. However, shrinkage caused by the difference between vapor pressure of the air surrounding the ham and either the water or ice at its surface poses a serious problem.

ARS agricultural marketing specialist B. Hunt Ashby and agricultural economist George M. James, Hyattsville, Md., teamed with food scientist Amihud Kramer, University of Maryland, College Park, to compare the effect of three freezing methods, three packaging methods, and three storage periods on ham shrinkage in storage.

The researchers compared freezing in a still air room, a forced air room, and a blast freezer. Packaging methods included glazing plus polybagging, polybagging only, and glazing only. Storage periods during these tests were 2, 4, and 6 months, at −5° F.

Weight loss during initial freezing is the most important factor contributing to total ham shrinkage during refrigerated storage. The faster a ham is frozen, the less it will shrink. Hams frozen in a blast freezer lose less weight than hams frozen in a forced air or still air room because blast freezers provide the fastest freezing rate. Hams stacked in the center of the test pallets, where they freeze slowly, lose more weight than hams stacked on the pallet load's outside surfaces where faster freezing occurs.

Glazing hams improves weight retention over polybagging. Glazing plus polybagging results in the least amount of shrinkage, but the differences between the three packaging techniques were not statistically significant.

One reason why polybagging did not provide a more effective protection against shrinkage in the experiments was because the bags were often punctured in warehouse handling. For maximum protection, bags should be relatively impermeable to moisture, adhere to the product so as to reduce free air space within the package, and be tightly sealed.

This technique allows considerable free air space between the film and the meat, permitting water vapor to escape the meat and condense as frost on the inside of the polyethylene film.

Reabsorption of glaze and condensation moisture during storage and thawing restores much of the weight lost during initial freezing, but the reabsorption ability of the meat decreases as storage time increases. Total shrinkage also goes up with time in storage, with the increase in shrinkage related to the decreasing reabsorption. □

***Below:** These pallet loads of hams are blast frozen at —5° F. Temperature readings are taken periodically to make sure all the hams are frozen (BN–39378).*

Lowering carcass fat in birds

RESEARCH on the carcass composition of broiler chicks could lead to leaner, meatier birds for the consumer and a cleaner environment for everyone.

In recent years, concern has grown about the quantity of animal fat consumed by humans. Moreover, the disposal of fat-contaminated water from poultry processing plants may cause pollution. Thus significant decreases in carcass fat would be an important contribution to cleaner water.

In four trials at State College, Miss., ARS scientists studied the effects of environmental temperature on fat, moisture, and protein content of broilers. Temperature control proved to be decisive in determining carcass fat. As temperature decreased, carcass fat decreased significantly, along with a simultaneous increase in moisture content. Carcass fat is measured by ether extract content, which indicates the fat levels in chicks between 1 day and 8 weeks of age.

The effects of temperature on carcass protein varied, but protein appeared to decrease with increasing temperature. Temperatures in the tests ranged from 45° to 90° F.

In the first trial, broilers were reared at two temperatures—65° and 85° F. Birds fed a high-energy diet at these temperatures had significantly less carcass moisture and more fat than those fed low-energy diets.

Feeding broilers the same level of protein at 65° F. and 85° F. increased the moisture and protein content of the carcasses and decreased the fat content at the lower temperature in the second trial.

Other researchers have shown that an imbalance of several different amino acids may increase fat deposition. Following these findings up in trial 3, the scientists fed the amino acid lysine at different levels as part of the diet. Results showed that chicks on a diet deficient in lysine had significantly more carcass fat than those fed diets with an adequate or excess supply of lysine.

Lysine is one of the more difficult amino acids to metabolize. Therefore, with the excess lysine supply, it is possible that the energy required for breaking down the lysine in the digestive system used up the additional energy available for fat deposition.

In the last trial, a basal starter diet was fed chicks for the first 4 weeks. A finisher diet containing approximately 21.7 percent protein was fed from 4 to 6 weeks of age. Results showed that protein and fat content of the carcasses increased with the age of the birds and the moisture content decreased.

ARS animal scientists Leon F. Kubena, James W. Deaton, and James D. May, agricultural engineer Floyd N. Reese, and technician Berry D. Lott conducted the trials.

Don't let the weeds drink the water

FALL WEED CONTROL in a fallow-wheat rotation system gives a high return for little investment.

Uncontrolled weeds in after-harvest wheat stubble produced an average of 1,070 pounds per acre (ppa) of dry matter over a recent 3-year period in Eastern Colorado. Three inches of valuable water was used by the weeds from late July until late September when they were nipped by frost.

By controlling the weeds, ARS soil scientist Bentley W. Greb, Akron, Colo., was able to increase storage of soil water during fallow by 1.60 inches and increase soil nitrate levels in these studies by an average of 30 ppa above that achieved with no fall weed control.

The practices improved the succeeding yield of wheat by 8.3 bushels per acre and straw by 855 ppa. In addition, the protein content of the wheat gained 0.8 percent and nitrogen uptake of grain was up 14 ppa.

Of eight methods of fall weed control studied, Mr. Greb found that either undercutting weeds with sweep V-blades at 1 and 5 weeks after harvest or using amitrol at 1.0 ppa each reduced weeds by 65 percent.

Plastic makes an impression

MAKING a good impression has more than social implications in the microscopic examination of leaf surfaces.

Usually, the investigator has to bring leaf specimens back to the laboratory. Then, a thin layer of surface tissue must be peeled up and placed on a slide, or various plastic-like substances are put on the surface after preparation to make an impression. These methods in the field are time-consuming, tedious, and inconvenient.

ARS geneticist Wayne W. Hanna, Tifton, Ga., found a way to get examinable material without the complications of other methods.

Dr. Hanna uses widely available aerosol cans of clear acrylic plastic. He just sprays the leaf surface in question, lets it dry for a few minutes, peels off the plastic, and has a perfect impression for examination.

The acrylic "mold" may be stored in the pages of a notebook for transport back to the laboratory, or the entire leaf can be stored and peeled later. The acrylic is dry mounted with a cover slip on a slide.

Morphological detail is almost exactly duplicated, since leaves can be sprayed while intact on the plant. However, Dr. Hanna points out that excess moisture on the plant surface, as from dew or rain, will cause cloudiness in the plastic.

The acrylic method does not require preparation, is very simple to apply, can make large numbers of impressions in a short time, and the only equipment needed is a small aerosol can of the plastic. It should be useful in studying epidermal surfaces in a wide range of fresh and dried material.

AGRISEARCH NOTES

Testing for calcium residue

A METHOD of removing and subsequently determining the amount of calcium residues on a milk contact surface can also be used to evaluate the effectiveness of the cleaning procedure in commercial dairy plants.

Milk passing through processing equipment in dairy plants deposits calcium residues and other material conducive to bacterial growth. This residue must be removed.

Some plants use an automated cleaning system to remove this residue (AGR. RES., Dec. 1967, p. 4). It is also possible to monitor the rate of removal of this type of residue with an electronic device (AGR. RES., Nov. 1971, p. 11).

Microbial assay, an indirect method most commonly used for evaluating the effectiveness of the cleaning procedure does not give a complete picture. A method which would determine the actual chemical residue on the surface would be more useful.

ARS agricultural engineers Maynard E. Anderson and James R. Fischer, working with microbiologist Robert T. Marshall and agricultural engineer Donald B. Brooker of the Missouri Agricultural Experiment Station, Columbia, and ARS agricultural engineer Tarvin F. Webb, Hyattsville, Md., sought to modify the microbial assay method and increase its usefulness by replacing hydrochloric acid with another less corrosive but equally effective acid.

The researchers subjected 192 stainless steel plates to a simulated cleaning procedure in an experimental spray stand, using hydrochloric, nitric, phosphoric, and lactic acid in low concentrations, 1.0 and 0.1 normal, to evaluate their effectiveness in removing calcium.

On the basis of these studies, nitric acid is now recommended in the procedure for determining the amount of milk residue remaining on that surface after cleaning. A 0.1 normal concentration of nitric acid removes calcium deposits as effectively as three other acids tested and is noncorrosive as well as inexpensive and easy to obtain.

Removing calcium residue from a milk-soiled surface with acid is based on the principle that calcium is ionized from calcium caseinate when the acidity (or pH) is reduced sufficiently to break down casein. Calcium is made soluble in an acid solution, and its quantity in the resulting solution is analyzed by atomic absorption spectroscopy.

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